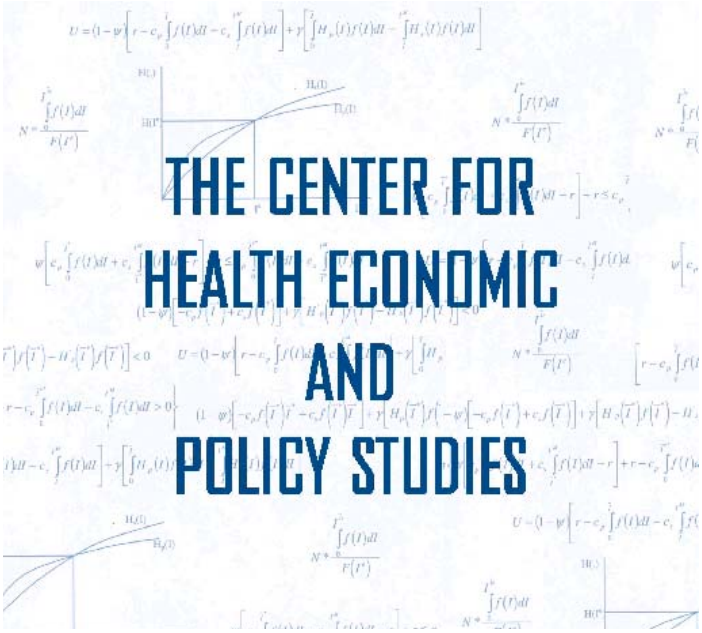

DO NONPROFIT AND FOR-PROFIT HOSPICES REALLY DIFFER? AN ANALYSIS OF THE HOSPICE INDUSTRY

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Abstract:

We address the question of whether nonprofit and for-profit hospices respond differently to a given set of incentives resulting from the way Medicare reimburses hospice care. Medicare reimburses all hospices using a fixed per diem rate, but the cost function confronting a hospice is not linear. The cost of a marginal day of care is relatively high at the onset of care and again relatively high in the days immediately prior to the death. The conjuncture of hospice cost structures and exogenously-determined prices provide financial incentives to profit-maximizing hospices to maximize the length of stay of their patients.

We use a unique dataset that consists of all urban Medicare admissions at for-profit and religious hospices in 1993. For-profit hospices are significantly less likely to admit patients with short expected length of stay; the mechanism by which they do so is likely to be skimping on services attractive to such patients. We also find that for-profit hospices admit patients at earlier stages of their illness. The results support a model of nonprofit behavior where nonprofit hospices maximize profit on profitable patients and subsidize care of less profitable care to satisfy their mission.

Introduction

This paper focuses on the question of whether nonprofit and for-profit hospices behave differently—that is, respond differently to a given set of opportunities. Differences would occur if the two types of organizations pursue different objective functions, are subject to different constraints in such forms as tax rules and regulatory restrictions, or both. It is clear that some forms of constraints do vary across institutional forms. In addition to the differential tax-subsidies noted above, nonprofits have access to sale of tax-exempt bonds and often receive substantial amounts of volunteer labor that may not be available to for-profit organizations (Independent Sector 199x, and Segal and Weisbrod 2002), though for Medicare-certified hospices they must have at least 5% volunteer labor regardless of ownership. They also confront constraints that are more restrictive, however, than is the case with for-profit firms: nonprofits are restricted from distributing profit or surplus to any manager, director, or "owner" of the organization, and because of this "nondistribution constraint" (Hansmann 1980), nonprofits do not have access to private equity capital markets.

There are many mixed industries in which nonprofit and for-profit organizations, and sometimes, governmental organizations, coexist—e.g., hospitals, nursing homes, higher education, day care, and museums. Since nonprofit and governmental organizations have access to subsidies not available to private firms, it is natural to ask what society gains in return for those subsidies. The subsidies take such forms as exemption from taxation on corporate profits, real property, and sales, and eligibility for tax-deductible private donations.

Nonprofits and for-profits may respond differently to given opportunities not only because constraints differ but also because their missions or objective functions differ. Nonprofits may pursue the goal of providing, even maximizing, provision of outputs that while socially valuable, are privately unprofitable—for example, health care, education, and other social services for the poor, public goods such as basic research and community education, and services for which buyers are asymmetrically under-informed, relative to sellers, about output quality. In the latter case, a nonprofit might pursue the goal of not taking advantage of its informational superiority—perhaps because it has less incentive to do so, in light of the nondistribution constraint or because it does not want to do so, or both. The state of economic theory is currently not strong enough, however, to make strong predictions as to the comparative behavior that can be expected of nonprofit and for-profit organizations (Hansmann 1980, Weisbrod 1975, James 1983, Newhouse 1972).

At the empirical level, work in a variety of industries has shown a mixed pattern of differential behavior in a number of dimensions. For example Mauser (1998) examined day care centers; Weisbrod, (1988,1998), and Kapur and Weisbrod (2001) examined nursing homes and facilities for the mentally handicapped; Norton and Staiger (1996) and Sloan (1998) studied hospitals. This paper extends previous empirical work on mixed industries to another industry, hospices, and to another type of constraint, the governmentally-set price. We pose the question of whether the incentives operating through the pricing system, when, as is often the case, they are identical for nonprofit and for-profit organizations, lead to systematically different responses for the two ownership forms.

Medicare Reimbursement of Hospices

If a terminally ill patient chooses to receive care from a hospice, the patient gives up reimbursement for other Medicare services related to curative treatment (Medpac 2002). Patients will do so in order to live relatively normal lives while the disease runs its course. In return, a hospice will provide the patient with palliative care, bereavement counseling and other services. Under Medicare rules, a hospice may provide palliative treatment, rehabilitation, or provide/arrange for curative treatment only for other ailments not related to the principal diagnosis. Medicare beneficiaries must be certified by a physician and the hospice medical director to have a life expectancy of six months or less. After 90 days the patient needs be recertified to continue receiving hospice services. After two 90 day periods, recertification is required over 60 day intervals.

Medicare is the dominant payer for hospice services, and payment is at a flat rate per day the patient is served by the hospice. Hamilton (1993) found that the probability a hospice is Medicare-certified, regardless of ownership type, was correlated with the level of the rate. Hamilton's focus was on the per diem payment levels and thus did not consider different payment mechanisms. Huskamp and colleagues (2001) note that such payment may provide implicit financial incentives that may well be in conflict with the efficient use of hospice services.

The per diem rate is the same regardless of the illness, though it varies by location of care[1]. The rationale for not differentiating between illnesses is that hospices are designed to only provide care that is not curative; which at one time was not disease specific. Nevertheless, the technology of palliative care has changed significantly since fixed per diem rates were established and recently chemotherapy or radiation therapy

based palliative care is useful for some patients, but not all. Nevertheless, the fixed per diem reimbursement remains in effect, and thus, hospices face a linear revenue function with respect to length of stay.

The cost function confronting a hospice, contrary to the revenue function, is not linear. The cost of a marginal day of care is relatively high at the onset of care, when there are initial costs of learning about the patient's and family members' physical and emotional needs, and for developing a plan for facilitating the adjustment to the impending death. Costs are again relatively high in the days immediately prior to the death. Between the high costs at the start and at the end of the period of care, costs are lower (Huskamp *et al*, 2001, Carey, Burns and Brobst, 1989). This pattern of cost is the same for all diagnoses. However, some patients may benefit from relatively expensive types of palliative care; which would shift the average cost function up. In addition, other types of patients may benefit from other types of care such as durable medical equipment (DME) or activities; such as recreation.

We use the fact that the cost function is u-shaped and the revenue function is linear to generate testable hypotheses about the behavior non-profit and for-profit hospices. The important implication is that, regardless of the diagnosis, longer lengths of stay will yield higher profits. Thus expected length of stay is almost perfectly correlated with expected profits. Furthermore, a patient's diagnosis is an excellent predictor of length of stay, leading to clear and observable incentives to attract patients with a certain diagnoses.

[1] Medicare pays four different rates: routine home care, continuous home care, inpatient respite day, and general inpatient day. Routine home care is by far the most common.

Conceptual Framework

There are two ways a hospice can maximize length of stay and, in doing so, profits. First, a hospice may convince patients (and their family) that they should enter the hospice sooner rather than later. This requires a decision by the patient to give up curative care earlier than they otherwise would. Early admission will lead to a longer length of stay, *ceteris paribus*. Second, hospices can make themselves more attractive to patients (or their referring physicians and families) with certain diagnoses associated with longer lengths of stay by offering attributes or marketing themselves to be more desirable to such patients.

Conversely, hospices may make themselves less attractive to patients with less profitable diagnoses and/or shorter lengths of stay by not offering attributes desirable to those patients (such as relatively expensive types of palliative care). In addition, they may avoid marketing to referring physicians whose patients are generally in unprofitable diagnoses. At one extreme, although it is not allowed under Medicare rules, hospices have been known to deny admission to unprofitable patients.

This type of selection bias through skimping/stinting (or offering "too much" care) is usually associated with competition among health plans. For example, a health plan may skimp on services that are expensive, but at the same time predictable by the patient. By under-providing such services the profit maximizing health plan may deter patients who might otherwise self-select into a health plan. Similarly, a hospice may skimp on services that are attractive to patients who have a relatively short expected length of stay or a diagnosis which would make them benefit from higher tech, more expensive treatment. Hospices can influence their patient mix in a manner analogous to

health plans by adjusting the quality and quantity of the services they offer. They may not offer relatively expensive palliative chemotherapy or radiology. Alternatively, they may offer DME, which is attractive to non-cancer patients. Or they may offer activities and amenities for patients who have ceased curative care, but still are relatively active mentally or physically. For example, a dementia patient may benefit from light physical activity, whereas a patient who is confined to a bed would not. In addition, a hospice may market itself to referral sources that treat dementia but not referral sources that deal with cancer patients.

This approach towards explaining the mechanism behind adverse selection is based on Frank, Glazier, and McGuire (2000). The research on health plans incorporates the fact that there is asymmetric information between prospective enrollees and the health plan. The health plan may make themselves more attractive to profitable enrollees, who then self-select into the most attractive plan. Asymmetric information between patient and the hospice is not as much of a problem with hospice care because both parties can observe the diagnosis and prognosis upon admission. Furthermore, a hospice that serves (thus licensed by) Medicare cannot explicitly discriminate among patients based on their expected profitability. Rather, the hospice is required to accept patients who seek care (conditional on capacity constraints and assurances that circumstances of the admission are valid under Medicare guidelines). Thus, the problem of asymmetric information in the hospice industry is between the hospice/patients and Medicare.

While hospice programs are designed for "terminally ill" persons and their families, the determination of the term, "terminally ill," is problematic for two reasons: the exact date a person will die is uncertain, and the date at which a person "should" be

admitted to a hospice, even if the date the person will die were known, is subject to judgments related to the specific patient, physician and family. These subtleties involve information that, to some degree, is asymmetric among the decision-makers involved—patients/families, hospices, and third-party insurers, specifically, Medicare.

In particular, hospices are typically better informed than are Medicare officials, and so hospices have a financial incentive to take in patients as far as possible in advance of the expected date of death. Medical ethics, however limited, would presumably prevent even the most aggressive of hospices from "admitting" a patient decades before the expected date of death. Medicare rules also constrain the date of admission, by restricting admissions to patients expected to die within six months. However, *ex ante* uncertainty about the duration of life for a specific person has limited the Medicare program's willingness (or ability) to establish rigid maximum duration. Our decomposition of early admission and adverse selection in this paper is purely empirical. A hospice that markets itself aggressively to patients (or the referral agents) with diagnoses associated with longer lengths of stay will likely encourage such patients to enter sooner than they otherwise would.

Whatever the constraints on duration of the hospice stay—by any individual or on average—the question is whether for-profit hospices take greater advantage of their informational superiority over Medicare officials, thereby attracting patients with a longer mean length of stay (LOS). A sizable proportion of the variation in expected length of stay is due to diagnosis rather than other factors. Thus there is ample opportunity to cream-skim only the diagnoses with long expected lengths of stay and

skimp on service provided (or marketing) to patients of other diagnoses with shorter expected lengths of stay.

A finding of no difference in admission timing and the share of patients with each diagnosis would suggest that nonprofits act like profit-maximizing private firms. A finding that nonprofits' have a share of patients with a shorter expected length of stay than for-profits would suggest that nonprofits are somehow pursuing different objectives. The non-profit's behavior in this case could result from a model in which nonprofits' objective functions are non-profit-maximizing "bonoficers" (Weisbrod 1988), a model in which nonprofits are inefficient (Alchian and Demsetz 1972), or the market is segmented such that they maximize profit on some patients but distribute those profits to other patients (Weisbrod, 2003).

The empirical implication of Weisbrod's (2003) model is that non-profits should compete directly with for-profits for the profitable patients. Thus, we'd expect similar numbers of profitable patients at non-profit and for-profit facilities. However, if non-profit hospices are using the surplus to subsidize the care of unprofitable patients, then we'd expect larger numbers of unprofitable patients at non-profit hospitals. In contrast, if non-profits were non-profit-maximizing "bonoficers" or simply inefficient, we'd expect fewer numbers of profitable patients at non-profit hospices, *ceteris paribus*.

This paper is a study of the behavior that is a result of the incentives of the Medicare reimbursement system, and is positive in nature. The normative implications of the Medicare reimbursement system on for-profit and non-profit behavior and social welfare are not pursued here. On the one hand, it may be beneficial to society if terminally ill patients give up curative care sooner rather than later. Thus, the profit-

seeking behavior may be in-line with societal goals. On the other hand, the fact that certain types of patients are *ex-ante* more profitable may lead to under-provision of beneficial services to unprofitable patients and over-provision of such services to profitable patients. Thus, the current reimbursement system may lead to inefficiencies.

Methods[2]

The empirical analysis is composed of two parts. First we measure the extent that hospice average length of stay is influenced by early admission and differential admission of patients by observable characteristics that are correlated with expected length of stay. Second, we analyze the share and numbers of each type of patient by diagnosis and assess whether for-profit and religious non-profit hospices differentially admit certain types of patient.

Analysis of Hospice Length of Stay

First, we estimate a naïve survival model, ignoring patient characteristics that are observable to patients, hospice administrators, and referral agents:

$$los_{ijd} = f\left(hospice_j, forprofit_j\right) \quad (1)$$

where *hospice* controls for the type of the *j* hospice (i.e. free-standing, home-heath based, or other) and *for-profit* is a dummy variable indicating ownership. The subscript *i* indicates patient and the subscript *d* indicates diagnosis. Clearly, if there is cream-skimming by diagnosis or other patient characteristics the estimate of:

$$\Delta forprofit^N = E(los_{ijd} \mid forprofit = 1) - E(los_{ijd} \mid forprofit = 0) \quad (2)$$

will be biased. Here, the superscript *N* indicates the naïve estimate.

[2] A previous version of this paper applied a model in the spirit of Frank, Glazier and McGuire (2000), where the incentives to skimp or stint were measured by a shadow-price. The results showed that expected

Next, we estimate:

$$los_{ijd} = f\left(patient_i, disease\ type_d, hospice_j, forprofit_j\right) \quad (3)$$

where *patient* includes demographic information of patient *i* and information about the patient's health care utilization during his last hospitalization; *disease type* is a dummy variable indicating each of the 27 Charlson diagnoses described below. The estimate of:

$$\Delta forprofit^D = E(los_{ijd} \mid forprofit = 1; patient_i, disease_d) - E(los_{ijd} \mid forprofit = 0\, patient_i, disease_d) \quad (4)$$

is conditional on all observable characteristics to the hospice and the patient. The superscript *D* indicates control for diagnoses and patient characteristics. If the differences found in Equation 2, and completely due to differential selection on diagnosis, we would expect that the within diagnosis estimates in Equation 4 to be not significantly different in zero. The estimates of Equation 2 and 4 can be used to quantify the effect of differential selection on expected length of stay as follows:

$$Selection = \Delta forprofit^D - \Delta forprofit^N \quad (5)$$

When we estimate of Equations 1 and 3 we assume that the hospice cannot control the timing of admission. Rather the hospice is only able to influence the duration until death. However, as described above, a hospice will have strong incentives to admit patients sooner. Furthermore there may be a difference between nonprofit and for-profit hospices regarding the proclivity towards early admission.

Thus the estimates of Equation 4 are likely to still be inconsistent because of this unobserved tendency. We control for this using a method of residual substitution based

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length of stay completely described such incentives. Because the results were intuitively obvious, we have

on Terza (2003). We use a two-stage approach which is less efficient than Full Information Maximum Likelihood, but yields consistent estimates. In the first-stage, we model the time between hospital discharge and hospice admission as follows:

$$time-between_{ijd} = f\left(patient_i, disease\ type_d, instruments_m\right) \tag{6}$$

where *time-between* is the number of days between hospital discharge and hospice admission, and *instruments* is a vector of instruments that are correlated with the length of time between hospital discharge and hospice admission, but uncorrelated with the length of stay at the hospice. Specifically, the instruments are the number of nursing home, intensive care facility, skilled-nursing facility, hospice days and hospice beds per person over 65; the number of hospice days, and the mean number of years the hospice has been in operation.

Using the results from Equation 6, we calculate the residual:

$$\Delta time-between_{ijd} = time-between_{ijd} - \hat{f}(\bullet) \tag{7}$$

In the second stage, we re-estimate Equation 3 including the residual calculated in Equation 7:

$$los_{ijd} = f\left(patient_i, disease\ type_d, hospice_j, forprofit_j, \Delta time\text{-}between_{ijd}\right). \tag{8}$$

The estimates from Equation 8 can then be used to measure:

$$\begin{aligned}\Delta forprofit^C = {} & E(los_{ijd} \,|\, forprofit = 1; patient_i, disease_d, \Delta time-between_{ijd}) \\ & - E(los_{ijd} \,|\, forprofit = 0\, patient_i, disease_d, \Delta time-between_{ijd})\end{aligned} \tag{9}$$

where the superscript *C* denotes corrected estimates. The estimate can be interpreted as the differential effect of being treated at a for-profit hospice, conditional upon diagnosis, patient characteristics, and controlling for a differential time of admission. Finally, the

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excluded this model in this version of the paper.

difference between Equation 4 and Equation 9 yields an estimate of the effect of early admission on hospice length of stay:

$$Early\ Admission = \Delta forprofit^{C} - \Delta forprofit^{D}. \quad (10)$$

If *Early Admission* is significantly different than zero, we can conclude that there is a difference in the time of admission at nonprofit and for-profit hospitals.

To implement this model, we assume that the durations follow a Weibull distribution and control for the presence of censoring of the hospice length of stay. Preliminary analysis of the distribution of hospice length of stay revealed a pattern consistent with a Weibull distribution. Regardless, the results and the conclusions are not reliant of the particular functional form assumption. All standard errors in this analysis are bootstrapped, such that each equation is re-estimated in the same iteration. For example to calculate the standard errors of Equation 10, we need to re-estimate Equations 3, 4, 6, 7, 8, and 9 in each iteration.

Analysis of Share of Patients

The second part of the analysis tests whether the share of patients at each hospice type is consistent with the expected length of stay. To this end, we estimate the following equation:

$$\frac{n_{dj}}{N_j} = \alpha + \beta_1 hospice_j + \beta_2\ for\text{-}profit_j + \mu_m + \varepsilon_{dj} \quad (11)$$

where μ_m is a market fixed effect and ownership includes a for-profit dummy variable and a secular non-profit dummy variable. Non-profit hospices are the excluded category. Equation 11 is a test of whether the share of patients in each diagnosis group varies by ownership type. In order to compare different diagnoses, we measure the relative

profitability of each diagnosis by calculating the expected length of stay for each diagnosis using the results of Equation 9. Then we normalize the expected length of stay to create an index of profitability. In and earlier version of this paper we calculated the shadow price of each diagnosis by adapting Frank, Glazier, and McGuire (2002) to the hospice industry. However, the resulting shadow price was highly correlated with expected length of stay, and thus use expected length of stay, and in doing so, simplify exposition.

The results in Equation 11 do not yield insight into the question of whether the shares of profitable diagnoses at for-profit hospices are due to the fact they attract more profitable patients, or whether they fail to attract unprofitable patients. Recall that if non-profit hospices maximize profits associated long length of stay patients and redistribute those profits to short length of stay patients we would expect the number of profitable patients to be similar.

We test whether this occurred as follows. First, we estimate the expected number of admissions for each diagnosis in markets where there is no for-profit hospice penetration using the following specification:

$$n_{dj} = f(hospice_j, \mu_m) \tag{12}$$

where *f(.)* is assumed to be a negative binomial distribution, and *hospice* includes a measure of the size of the hospice. Using Equation 12 we generate out-of sample predictions to estimate the expected number of admissions, $E(n_{dj})$, at all hospice in markets that have not been entered by for-profit hospices. Next, we model the actual number of admissions by diagnosis as a function of $E(n_{dj})$:

$$n_{dj} = f(E(n_{dj}), forprofit_j, \mu_m) \quad (13)$$

If nonprofit hospices were behaving like for-profit hospices with respect to the profitable patients and redistribute the profits to unprofitable patients, then we'd expect the coefficient on the *forprofit* to be insignificant for patients with profitable diagnoses, and negative and significant for patients with unprofitable diagnoses. To test for robustness, we also estimate a version of Equation 13 where we replace, $E(n_{dj})$, with *hospice* as defined in Equation 12.

Data

The dataset used in this analysis is identical to the one used in Christakis and Iwashnya (2000). The data include all admissions to hospices that were reimbursed by Medicare and newly admitted in 1993. The patients were followed until August 20, 1996 and mortality status was confirmed using the Hospice Standard Analytic File (SAF) and the Vital Status File (VSF). A 730-day look back window was constructed prior to the hospice admission using the MEDPAR data. Information was drawn on the prior inpatient admissions of the patient during the look back window.

Table 1 presents the summary statistics of the patients in the data and defined the variables included in the *patient* vector defined above. Overall there are 173,689 patients treated at private hospices. Of these, 33, 674 were treated at for-profit hospices and 125,430 at religious non-profit hospices. The average length of stay at a religious non-profit hospice was about 85 days whereas it was over 100 days at for-profit hospices. On average there were 200 days between the last hospital admission and the hospice admission, though more time elapsed between hospital discharge and admission at for-profit hospices. The average patient age is about 77 years old and over 85% of the

patients were white. About 20% of the patients were transferred to the hospice directly from a hospital; however. Overall patients admitted to for-profit hospices were more likely to be enrolled in an HMO; have fewer comorbidities; and fewer surgical procedures.

Table 2 presents the summary statistics for the hospices. Overall there are 1297 hospices in our data. This represents all of the private hospices that accept Medicare patients in the country as of 1993. 945 of those are religious non-profit and 218 are for-profit. The majority of for-profit hospices are free-standing; whereas the religious non-profit hospices are generally free-standing or home-health based. Secular non-profit hospices tend to be hospital based. In the empirical analysis, unless otherwise noted, we limit the sample to patients who were admitted to either for-profit or religious non-profit hospices in urban areas. We do so because the vast majority of secular hospices are linked to hospitals. This linkage causes unique admission patterns that are beyond the scope of this analysis. The results including hospices with secular ownership and a separate secular dummy variable, are identical with respect to for-profit/religious non-profit comparisons. The lower part of Table 2 displays the means and standard deviations of the market-level variables, from which we draw our instruments.

Table 3 displays the number of patients, hospice share and expected hospice length of stay for each diagnosis. Lung cancer patients comprise close to 20% of the admissions at both nonprofit and for-profit hospices. For the most part, there is a larger share of patients with neoplasm diagnoses at nonprofit hospices. The most dramatic difference in shares is of patients with diagnoses of Dementia, Parkinson's, Stroke and Liver; the share of patients with these diagnoses at for-profit hospices is almost double

that of nonprofit hospices. For the most part, patients with neoplasm diagnoses have a shorter expected length of stay than patients with non-neoplasm diagnoses. The longest expected lengths of stay are associated with patients with Dementia, Parkinson's, Other neurological, and COPD.

Results

The results of the duration analysis of hospice length of stay are in Table 4. The first column present the naïve estimates based on Equations 1 and 2. The second column contains the estimates which control for disease and patient characteristics from Equations 3, 4, and 5. The last column contains the two-stage estimates from Equations 6-10. The naïve estimates reveal that patients admitted to for-profit hospices have a longer (unconditional) length of stay of about 34 days. This result is significant at the 1% level. This result is consistent with the means; the only difference is the distributional assumption and that we control for censoring in the Weibull model. When we condition on disease type and patient characteristics, patients at for-profit hospices experience a length of stay that is about 15 days longer, though it is not as long as the naïve estimate. The difference between the within disease and naïve estimates is about 19 days and is significant at the 1% level.

The two-stage estimates are in the third column. The first-stage estimates are included in the Appendix. Of note is that the instruments are jointly significant in the first-stage with a test statistic of 65.17 and a p-value less than 0.01. The instruments pass the test for over identifying restrictions where we fail to reject the null with a p-value of 0.16. This test is a likelihood ratio test which compares the likelihood function of the two-stage estimates with the likelihood estimates which replace the first-stage residual

and the for-profit dummy with the six instruments (See e.g. Norton, Lindrooth and Ennet, 1998). The two-stage estimates control for both selection of patients and early admission of patients. The length of stay is now less than a day longer at for-profit hospices. The effect of early admission is calculated to be about 14.5 days and is significant at the 1% level.

The estimates of the early admission effect by diagnosis are in Table 5. We only report diagnoses for which the instruments were significant in the first-stage and were validly excluded from the second stage. The instruments were valid for half of the diagnoses. The first column contains the estimates of the for-profit differential in days, without controlling for early admission. The second column contains the estimates controlling for early admission. The last column is the difference between the estimates in columns 1 and 2, or the effect of early admission on hospice length of stay. The effect of early admission of hospice length of stay is substantial for patients with Dementia, Parkinson's, and Stroke. Early admission lengthens the stay of patients by about 30-40% at for-profit hospices for these diagnoses. The effect of early admission on other diagnoses is significant but smaller in magnitude.

The results of the analysis of hospice share of patients and the total number of patients are in Table 6. The first column is the normalized expected length of stay; the second column contains the results of the regression of hospice share on the for-profit dummy, hospice type controls and includes market fixed effects. The third column contains the estimates from the Negative Binomial count data model of number of hospice admissions controlling for market fixed effects, hospice type, and hospice size. The last column is also Negative Binomial count data model of number of hospice

admissions, but controls for market fixed effects and the expected number of admissions from the first stage (See Equations 12-13). Recall, that the first stage only uses a sample of hospices in markets without a for-profit hospice.

The results reveal that for-profit hospices have a larger share of patients with non-neoplasm diagnoses which tend to have a relatively long length of stay. The differences are most striking in especially Dementia and Stroke patients. However, the results in Column 2 reveal that the numbers of these patients are about what is to be expected for the typical hospice. The high shares result from fewer admissions of patients with neoplasm diagnoses which tend have a much shorter length of stay, as seen in the coefficients in the last two columns. Thus it is not the case the for-profit admit more profitable patients; rather they admit fewer unprofitable patients.

Conclusion

One implication of our results is that patients with diagnoses that have higher expected profitability (or equivalently longer length of stay) comprise a relatively high share of overall patients at for-profit hospices. Thus, for-profit hospices have a larger share of profitable patients leading to higher profits. The mechanism by which this occurs is that religious nonprofit and for-profit hospices compete equally for the 'profitable' patients, but the nonprofit hospices just attract more unprofitable patients.

The mechanisms by which for-profit hospices can deter patients with cancer diagnoses include failure to offer attributes that are attractive to cancer patients or failure to market themselves to the referral agents of cancer patients. Others have pointed out that patients with neoplasm-based diagnoses have faced problems with access to relatively expensive chemotherapy- or radiation therapy-based palliative care (Huskamp

et al 2001). Failure to offer this type of care is likely to be an effective way for profit maximizing hospices to avoid patients with short expected lengths of stay and thus maximize profits. We predict that these patients might continue face access problems even if chemotherapy- or radiation therapy-based palliative care were reimbursed at a higher rate reflective of its cost. Patients who could potentially benefit from this type of care could continue to face access problems because they generally have short expected lengths of stay.

We also showed that for-profit hospices somehow admit patients at earlier stages in their disease than non-profit hospices. This may be a result of aggressive recruiting and marketing to patients (or families) regarding the benefit of hospice care. It may also be to integration between home-health care agencies and hospices; such integration is common among for-profit hospices. Sacrificing curative care earlier rather than later may or may not be desirable from the perspective of social welfare. This paper is positive in nature and more research is required to determine the normative implications of early hospice admission on, especially, dementia or stroke patients. Though it is clear that because certain types of patients are *ex-ante* less profitable, a profit maximizing hospice will under-provide services to patients with shorter expected lengths of stay and may over-provide services to profitable patients. Thus, the current reimbursement system may lead to inefficiencies.

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Table 1. Patient Characteristics

	All Patients[1]	For-profit	Religious Non-profit
Number of Patients	115,218	23,873	91,345
Dependent Variables			
Hospice Length of stay	113.294	145.561	104.861
	(226.631)	(277.547)	(210.500)
Days between hospital	206.738	234.933	199.369
discharge & hospice admission	(286.313)	(303.151)	104.861
Patient Characteristics *(Patient)*			
Age	77.152	78.818	76.717
	(9.637)	(10.072)	(9.472)
White	0.879	0.851	0.887
	(0.326)	(0.356)	(0.317)
Male	0.493	0.465	0.500
	(0.500)	(0.499)	(0.500)
Transfer from Hospital	0.191	0.223	0.182
	(0.393)	(0.417)	(0.386)
HMO Enrollment	0.080	0.091	0.077
	(0.271)	(0.287)	(0.266)
Psychiatric Index	0.043	0.038	0.044
	(0.203)	(0.191)	(0.206)
Substance Abuse Index	0.811	0.769	0.822
	(0.392)	(0.421)	(0.383)
Indicator for Charlson	3.870	3.222	4.039
Diagnosis	(3.044)	(2.963)	(3.043)
Charlson Comorbidity Score	0.010	0.012	0.009
	(0.098)	(0.107)	(0.095)
Dialysis within 90 days	0.013	0.015	0.012
	(0.113)	(0.120)	(0.111)
Dialysis within 730 days	0.005	0.006	0.005
	(0.070)	(0.074)	(0.069)
Enteral feeds within 90 days	0.008	0.008	0.007
	(0.087)	(0.090)	(0.086)
Enteral feeds within 730 days	0.048	0.089	0.038
	(0.215)	(0.285)	(0.191)
Feeding tube within 730 days	0.038	0.051	0.034
	(0.190)	(0.220)	(0.181)
Transfusion within 90 days	0.102	0.105	0.102
	(0.303)	(0.306)	(0.302)
Surgical procedure count	1.118	0.910	1.173
	(1.510)	(1.418)	(1.529)
Surgical procedure indicator	0.348	0.389	0.337
	(0.476)	(0.488)	(0.473)

Standard Deviation in Parentheses. 1: Includes Secular Non-profit hospices

Table 2. Hospice Characteristics and Instruments

	All Hospices[1]	For-profit	Religious Non-profit
Number of Hospices:	651	113	538
Hospice			
Hospital-based	0.130	0.090	0.140
	(0.336)	(0.287)	(0.347)
Home-health	0.286	0.177	0.314
	(0.452)	(0.382)	(0.464)
Free-standing	0.585	0.733	0.546
	(0.493)	(0.443)	(0.498)
Market Level Variables			
Average Size of Hospice	610.181	N/A	N/A
	(681.414)		
Number of Hospices	6.99		
	(8.027)		
Instruments:			
NH Beds per Population over 65 (100s)	4.56		
	(2.001)		
ICF Beds per Population over 65 (100s)	0.029		
	(0.129)		
SNF Beds per Population over 65 (10,000s)	0.016		
	(0.029)		
Hospice Beds per Population over 65 (100s)	0.003		
	(0.017)		
Hospice Days per Population over 65	0.002		
	(0.003)		
Mean years in operation	7.327		
	(2.179)		

Standard Deviation in Parentheses. 1: Includes secular nonprofit hospices

Table 3. Number of Patients, Hospice Share and LOS by Diagnosis

Disease	# Patients (All)	# Patients (For-profit)	Share[1] (For-profit)	Share[1] (Non-profit)	Predicted LOS (Equation 8)
Neoplasm Diagnoses					
Head and Neck	2063	373	0.020 (0.014)	0.025 (0.026)	89.764 (28.505)
Upper GI Tract	3764	699	0.041 (0.059)	0.040 (0.024)	76.753 (25.371)
Colon and Rectum	9991	1578	0.083 (0.058)	0.103 (0.066)	87.208 (26.616)
Hepatobiliary System	3115	552	0.032 (0.020)	0.038 (0.054)	52.976 (17.100)
Pancreas	4649	708	0.044 (0.029)	0.051 (0.052)	69.173 (22.201)
Lung	22,507	3525	0.206 (0.142)	0.215 (0.076)	72.221 (23.126)
Skin	917	151	0.014 (0.012)	0.016 (0.014)	70.448 (22.413)
Breast	5563	906	0.045 (0.027)	0.056 (0.032)	115.371 (32.031)
Female Genital Tract	3357	555	0.031 (0.018)	0.040 (0.037)	80.144 (24.181)
Prostrate	7444	1293	0.074 (0.053)	0.073 (0.034)	103.254 (29.251)
Urinary tract	3694	669	0.041 (0.032)	0.040 (0.027)	82.558 (27.790)
CNS	2510	432	0.027 (0.020)	0.028 (0.018)	100.523 (34.417)
Lymphoma	2105	310	0.023 (0.018)	0.026 (0.017)	73.110 (23.767)
Leukemia	2933	502	0.032 (0.037)	0.033 (0.030)	85.248 (28.245)
Other Neoplasms	6023	814	0.056 (0.046)	0.071 (0.060)	77.777 (25.768)

Standard Deviation in Parentheses.

Notes: 1: Share of disease type of total admissions at hospice

Table 3. Number of Patients, Hospice Share and LOS by Diagnosis (continued)

Disease	# Patients (All)	# Patients (For-profit)	Share[1] (For-profit)	Share[1] (Non-profit)	Predicted LOS (Equation 8)
Non-neoplasm diagnoses					
Dementia	2965	1315	0.065 (0.066)	0.026 (0.034)	276.572 (77.373)
Parkinson's	844	323	0.020 (0.020)	0.011 (0.011)	214.000 (60.860)
Other neurological	1007	198	0.014 (0.010)	0.015 (0.013)	210.196 (64.565)
CHF	6266	1755	0.077 (0.041)	0.058 (0.042)	163.903 (53.089)
Other CVD	5011	1726	0.058 (0.055)	0.044 (0.036)	172.750 (58.063)
Stroke	3946	1546	0.073 (0.077)	0.031 (0.031)	125.013 (42.403)
COPD	5069	1347	0.059 (0.037)	0.046 (0.031)	196.723 (59.483)
Liver	1144	299	0.036 (0.124)	0.016 (0.013)	96.226 (30.144)
Renal	2292	624	0.030 (0.016)	0.025 (0.025)	58.642 (26.892)
AIDs	749	180	0.021 (0.040)	0.016 (0.025)	137.077 (49.386)
Other Infections	740	128	0.028 (0.071)	0.016 (0.015)	82.533 (29.185)
Other non-neoplasms	4550	1365	0.056 (0.050)	0.047 (0.047)	144.428 (48.433)

Standard Deviation in Parentheses.

Notes: 1: Share of disease type of total admissions at hospice

Table 4. Duration Analysis of Hospice Length of Stay, All diagnoses

	Naïve Estimates	Within Disease Estimates	Two stage Estimates
For-Profit Hospice	0.840***	0.919***	0.996
(Hazard Ratio)	(0.006)	(0.007)	(0.008)
For-profit minus Religious	33.851***	15.169***	0.597***
(Days)[1]	(2.115)	(1.895)	(1.720)
Patient Selection Effect		–18.682***	
(Equation 5) [1]		(1.062)	
Early Admission Effect			–14.572***
(Equation 10) [1]			(0.771)
Disease Controls	No	Yes	Yes
Patient Characteristics	No	Yes	Yes
Hospice Type	Yes	Yes	Yes
Early Admission Control	No	No	Yes
Significance of the instruments in the first stage:			$X^2(6) = 65.17$ p-value <0.01
Test for over-identifying restrictions:			$X^2(4) = 6.55$ p-value = 0.16

Note: Religious non-profits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively.

1: Bootstrapped Standard Errors (500 Repetitions)

Table 5. Duration Analysis of Hospice Length of Stay, By diagnoses

	For-profit minus Religious (Days)	Two-stage For-profit minus Religious (Days)	Early Admission Effect (Days)
Pancreas	3.564	3.224	–0.340
	(5.778)	(5.945)	(1.234)
CNS	13.727	–2.138	–15.859***
	(10.391)	(8.494)	(5.738)
Lymphoma	–1.880	–3.216	–1.339
	(10.517)	(137974.500)	(137974.400)
Leukemia	2.034	–6.810	–8.840**
	(9.868)	(9.289)	(3.516)
	12.163*	4.370	–7.757***
Other neoplasms	(6.363)	(5.654)	(2.811)
Dementia	121.140***	–3.805	–118.226***
	(40.568)	(36.906)	(21.048)
Parkinson's	22.985	–36.433	–58.688**
	(51.268)	(44.144)	(23.351)
Other neurological	121.272	67.855	–52.030
	(3.54 X E+08)	(1.38 X E+08)	(1.35 X E+09)
CHF	45.632***	13.820	–30.722***
	(14.674)	(13.026)	(6.464)
Other CVD	31.173*	–3.247	–34.045***
	(17.376)	(16.395)	(6.181)
Stroke	97.641***	1.629	–83.673***
	(21.988)	(15.468)	(12.566)
COPD	26.101	–14.819	–40.491***
	(18.003)	(15.575)	(7.682)
Renal	–3.852	–5.917	–2.083
	(7.309)	(7.321)	(1.552)
Other non-neoplasm	80.471***	52.818***	–26.870***
diagnosis	(17.149)	(15.986)	(6.645)
Patient Characteristics	Yes	Yes	N/A
Hospice Type	Yes	Yes	N/A
Early Admission Control	No	Yes	N/A

Note: Religious non-profits are the excluded ownership category. Bootstrapped Standard Errors (500 Repetitions) in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively.

Table 6. Market Fixed Effect Analysis of the Hospice Share by Hospice Ownership and Disease

	Normalized E(LOS)	For-Profit (Share)	For-profit (Number)	For-profit (Number)
Neoplasm				
Head and Neck	0.78	–0.005	–0.402***	–0.248*
		(0.003)	(0.111)	(0.135)
Upper GI Tract	0.67	0.002	–0.395***	–0.290**
		(0.005)	(0.105)	(0.121)
Colon and Rectum	0.76	–0.007	–0.334***	–0.198*
		(0.010)	(0.101)	(0.111)
Hepatobiliary System	0.46	–0.003	–0.336***	–0.227*
		(0.010)	(0.106)	(0.121)
Pancreas	0.60	0.003	–0.297***	–0.130
		(0.010)	(0.110)	(0.123)
Lung	0.63	–0.001	–0.409***	–0.278***
		(0.012)	(0.100)	(0.106)
Skin	0.61	–0.004	–0.339**	0.019
		(0.003)	(0.148)	(0.162)
Breast	1.00	–0.006	–0.401***	–0.280**
		(0.005)	(0.103)	(0.117)
Female Genital Tract	0.69	–0.002	–0.363***	–0.244**
		(0.006)	(0.110)	(0.124)
Prostrate	0.89	–0.002	–0.354***	–0.175
		(0.006)	(0.104)	(0.114)
Urinary tract	0.72	0.005	–0.437***	–0.342***
		(0.005)	(0.105)	(0.121)
CNS	0.87	0.002	–0.348***	–0.184
		(0.003)	(0.115)	(0.133)
Lymphoma	0.63	–0.004	–0.432***	–0.204
		(0.003)	(0.121)	(0.132)
Leukemia	0.74	0.004	–0.420***	–0.303**
		(0.005)	(0.112)	(0.129)
Other Neoplasms	0.67	–0.019**	–0.399***	–0.309***
		(0.009)	(0.109)	(0.116)
Market Fixed Effects		Yes	Yes	Yes
Hospice Type Controls		Yes	Yes	No
Other Variables		None	Total Adm	$E(n_{dj})$
Estimation Method		OLS w/ FE	Neg. Bin. w/ FE	Neg. Bin. w/ FE

Note: Religious non-profits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and and 99% confidence levels, respectively.

Table 6. Market Fixed Effect Analysis of the Hospice Share by Hospice Ownership and Disease (continued)

	Normalized E(LOS)	For-Profit (Share)	For-Profit (Number)	For-profit (Number)
Non-Neoplasm Diagnoses				
Dementia	2.40	0.029***	0.211	0.165
		(0.008)	(0.131)	(0.143)
Parkinson's	1.85	0.004	0.154	0.160
		(0.003)	(0.143)	(0.168)
Other neurological	1.82	0.002	–0.129	–0.083
		(0.003)	(0.140)	(0.162)
CHF	1.42	0.013*	–0.060	–0.001
		(0.007)	(0.106)	(0.117)
Other CVD	1.50	0.016**	–0.087	–0.106
		(0.007)	(0.109)	(0.124)
Stroke	1.08	0.029***	0.096	0.048
		(0.006)	(0.118)	(0.132)
COPD	1.71	0.014***	–0.092	–0.159
		(0.005)	(0.105)	(0.121)
Liver	0.83	0.015	–0.018	0.088
		(0.012)	(0.114)	(0.145)
Renal	0.51	0.008**	–0.212*	–0.155
		(0.004)	(0.115)	(0.135)
AIDs	1.19	–0.004	–0.147	0.160
		(0.009)	(0.242)	(0.240)
Other Infections	0.72	0.002	–0.252	–0.100
		(0.003)	(0.181)	(0.169)
Other non-neoplasm diagnoses	1.25	0.017**	–0.109	–0.074
		(0.008)	(0.116)	(0.124)
Market Fixed Effects		Yes	Yes	Yes
Hospice Type Controls		Yes	Yes	No
Other Variables		None	Total Admissions	$E(n_{dj})$
Estimation Method		OLS w/ FE	Neg. Bin. w/ FE	Neg. Bin. w/ FE

Note: Religious non-profits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and and 99% confidence levels, respectively.

Appendix I. First Stage Survival Analysis of Time Between Hospital Discharge and Hospice Admission

Patient Characteristics	
Age	0.996
	(0.003)
Age Squared	1.000
	(0.000)
White	0.933***
	(0.009)
Male	0.980***
	(0.007)
Psychiatric Index	1.214***
	(0.014)
Substance Abuse Index	1.119***
	(0.017)
Indicator for Charlson Diagnosis	3.399***
	(0.041)
Charlson Comorbidity Score	1.117***
	(0.002)
Dialysis within 90 days	1.819***
	(0.111)
Dialysis within 730 days	0.699***
	(0.038)
Enteral feeds within 90 days	1.780***
	(0.129)
Enteral feeds within 730 days	0.878**
	(0.051)
HMO Patient	0.718***
	(0.010)
Feeding tube within 730 days	1.150***
	(0.019)
Transfusion within 90 days	2.157***
	(0.024)
Surgical procedure count	0.997
	(0.003)
Surgical procedure indicator	1.225***
	(0.012)
Market distance to provider	0.998***
	(0.000)
Hospital Transfer	40.569***
	(0.549)
Diagnosis	
Head and Neck	0.830***
	(0.020)
Upper GI Tract	0.984
	(0.018)

Diagnosis (continued)	
Colon and Rectum	0.754***
	(0.009)
Hepatobiliary System	1.101***
	(0.021)
Pancreas	1.156***
	(0.019)
Skin	0.935*
	(0.032)
Breast	0.803***
	(0.013)
Female Genital Tract	0.918***
	(0.018)
Prostrate	0.823***
	(0.012)
Urinary tract	0.993
	(0.018)
CNS	1.168***
	(0.025)
Lymphoma	1.198***
	(0.028)
Leukemia	1.209***
	(0.024)
Other Neoplasms	0.994
	(0.015)
Mean Size	0.969
	(0.021)
Number of Hospices	1.322***
	(0.022)
Instruments	
NH Beds per Population over 65	0.977
	(0.036)
ICF Beds per Population over 65	1.051
	(0.035)
SNF Beds per Population over 65	1.259***
	(0.019)
Hospice Beds per Population over 65	1.168***
	(0.019)
Hospice Days per Population over 65	1.108***
	(0.021)
Mean years in operation	1.212***
	(0.039)
F-test of Significance of Instruments	65.17
	(p<0.001)

Note: Hazard ratios are reported with standard errors in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively. N=111,165. Religious is the excluded ownership category.